CLAIMS

1. A turbine blade comprising:

an airfoil having opposite pressure and suction sidewalls extending chordally between opposite leading and trailing edges and in span between a root and a tip;

a supporting dovetail integrally joined to said airfoil root at a platform; and

said airfoil further including three internal cooling circuits separated from each other by imperforate bridges and extending in span therein, and each circuit includes a respective inlet channel commencing in axially adjacent alignment in said dovetail and twisting together through said platform into said airfoil behind said leading edge and in transverse adjacent alignment between said pressure and suction sidewalls.

2. A blade according to claim 1 wherein:

said airfoil further comprises an aerodynamic profile increasing in thickness from said leading edge to a hump of maximum thickness therebehind, and decreasing in thickness therefrom to said trailing edge; and

said three inlet channels are stacked together across said hump.

3. A blade according to claim 2 wherein said three cooling circuits radiate outwardly from said hump toward said leading and trailing edges.

4. A blade according to claim 3 wherein:

said three cooling circuits include respective rows of aperture outlets extending through said sidewalls; and

each of said circuits is configured for series flow of said cooling air from said inlet channels to said outlets to effect corresponding backflow margins between said cooling air discharged from said outlets and combustion gases flowable thereover.

5. A blade according to claim 4 wherein said three cooling circuits comprise:

a first cooling circuit including a first outlet channel extending in span directly behind

said leading edge, and separated from a corresponding first inlet channel by a perforate bridge to provide impingement cooling of said leading edge; and

said pressure and suction sidewalls around said leading edge include rows of corresponding first film cooling outlets discharging spent impingement air therefrom with a corresponding backflow margin.

6. A blade according to claim 5 wherein said three cooling circuits further comprise a second serpentine cooling circuit extending along said suction sidewall from a corresponding second inlet channel to a corresponding row of second outlets along said trailing edge for discharging spent cooling air therefrom with a corresponding backflow margin.

7. A blade according to claim 6 wherein said three cooling circuits further comprise a third cooling circuit disposed between said first and second cooling circuits, and extending transversely from said suction sidewall to said pressure sidewall.

8. A blade according to claim 7 wherein said third cooling circuit further comprises a third outlet channel extending in span along said pressure sidewall, and separated from a corresponding third inlet channel by a perforate bridge to provide impingement cooling of said pressure sidewall prior to discharge through corresponding third aperture outlets along said pressure sidewall.

9. A blade according to claim 8 wherein said second cooling circuit comprises a three-pass serpentine circuit.

10. A blade according to claim 9 wherein:

said second cooling circuit terminates in an array of pins prior to discharge through said second outlets; and

said third cooling circuit terminates in an array of pins including therebetween said third aperture outlets along said pressure sidewall.

11. A turbine blade comprising:

an airfoil having opposite pressure and suction sidewalls extending chordally between opposite leading and trailing edges and in span between a root and a tip;

a supporting dovetail integrally joined to said airfoil root at a platform; and

said airfoil further including three internal cooling circuits extending in span therein, and each circuit includes a respective inlet channel commencing in axially adjacent alignment in said dovetail and twisting together through said platform into said airfoil behind said leading edge and in transverse adjacent alignment between said pressure and suction sidewalls.

12. A blade according to claim 11 wherein:

said airfoil further comprises an aerodynamic profile increasing in thickness from said leading edge to a hump of maximum thickness therebehind, and decreasing in thickness therefrom to said trailing edge; and

said three inlet channels are stacked together across said hump.

13. A blade according to claim 12 wherein said three cooling circuits are separated from each other by internal bridges, and bridges separating said three inlet channels extend transversely between said pressure and suction sidewalls for locally cooling said hump using cooling air channeled through said three inlet channels.

14. A blade according to claim 13 wherein said three cooling circuits radiate outwardly from said hump toward said leading and trailing edges.

15. A blade according to claim 14 wherein:

said three cooling circuits include respective rows of aperture outlets extending through said sidewalls; and

each of said circuits is configured for series flow of said cooling air from said inlet channels to said outlets to effect corresponding backflow margins between said cooling air discharged from said outlets and combustion gases flowable thereover.

16. A blade according to claim 15 wherein said three cooling circuits comprise first, second, and third cooling circuits respectively terminating along said leading edge, trailing edge, and chordally therebetween.

17. A blade according to claim 16 wherein:

said first cooling circuit further comprises a first outlet channel extending in span directly behind said leading edge, and separated from a corresponding first inlet channel by a perforate bridge to provide impingement cooling of said leading edge; and

said pressure and suction sidewalls around said leading edge include rows of corresponding first film cooling outlets for discharging spent impingement air therefrom with a corresponding backflow margin.

18. A blade according to claim 16 wherein said second cooling circuit comprises a serpentine circuit extending along said suction sidewall from a corresponding second inlet channel to a corresponding row of second outlets along said trailing edge for discharging spent cooling air therefrom with a corresponding backflow margin.

19. A blade according to claim 18 wherein said second cooling circuit comprises a three-pass serpentine circuit.

20. A blade according to claim 19 wherein said second cooling circuit terminates in an array of pins prior to discharge through said second outlets.

21. A blade according to claim 16 wherein said third cooling circuit is disposed between said first and second cooling circuits, and extends transversely from said suction sidewall to said pressure sidewall.

22. A blade according to claim 21 wherein said third cooling circuit terminates in an array of pins including corresponding third aperture outlets along said pressure sidewall.

23. A blade according to claim 22 wherein said airfoil includes a slot extending in span along said pressure sidewall and joined in flow communication with said third outlets.

24. A blade according to claim 21 wherein said third cooling circuit further comprises a third outlet channel extending in span along said pressure sidewall, and separated from a corresponding third inlet channel by a perforate bridge to provide impingement cooling of said pressure sidewall prior to discharge through corresponding third aperture outlets along said pressure sidewall.

25. A blade according to claim 21 wherein said three cooling circuits are separated from each other by imperforate bridges.